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# United States Patent [19]

Slimak et al.

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[54] **ENHANCING THE STRENGTH, MOISTURE RESISTANCE, AND FIRE-RESISTANCE OF WOOD, TIMBER, LUMBER, SIMILAR PLANT-DERIVED CONSTRUCTION AND BUILDING MATERIALS, AND OTHER CELLULOSIC MATERIALS**

[75] Inventors: **Robert A. Slimak**, Springfield, Va.; **Christian C. Haudenschild**, Derwood, Md.; **Karen M. Slimak**, P.O. Box 2444, Springfield, Va. 22152

[73] Assignee: **Karen M. Slimak**, Springfield, Va.

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[58] **Field of Search** ..... 427/542, 553, 427/554, 351, 389.9, 391, 392, 393, 393.3, 393.4, 397, 397.8, 394, 395, 396, 439, 440; 428/537.1, 453

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*Primary Examiner*—Shrive Beck
*Assistant Examiner*—Michael Barr
*Attorney, Agent, or Firm*—Stevens, Davis, Miller & Mosher, L.L.P.

[57] **ABSTRACT**

Materials variously treated with sodium silicate were studied until enough information was obtained to find a way to solve the problems that have prevented sodium silicate from being the used as a fire retardant. These problems are: 1) water solubility (miscible with water), which results in extensive leaching when exposed to water, 2) cracking, chipping and peeling of treated surfaces, and 3) surface granulation. During flame tests it was discovered that sodium silicate formed a foam-like material, and this material was found to have become water insoluble, yet its elemental composition had remained virtually identical to that of the unmodified sodium silicate. This investigator proposes that under the influence of heat and dehydration, sodium silicate undergoes a polymerization process resulting in particles sizes too large to dissolve in water, and then developed a mechanism to explain how the process could occur. The temperature and moisture conditions in treated samples were then manipulated to cause the polymerization process to occur while protecting the wood from damage. Thus samples were prepared that were both water insoluble, and possessed effective fire retardant properties. These samples also proved to be stronger than untreated wood, thus providing an improved product that was fire retardant and moisture resistant. Since aqueous sodium silicate can be combined with other inorganic fire retardants, this technique is a potential method for making any inorganic fire retardants moisture resistant. This represents a potential breakthrough in fire retardants that has been sought for approximately 100 years. In addition, sodium silicate treated samples were made moisture resistant by the application of a micro-thin layer of silicon monoxide to the surface of samples. This technique, also never tried before, represents a second method for providing moisture resistant, fire retardant substances.

**11 Claims, 4 Drawing Sheets**